AMENDMENTS TO THE CLAIMS

Amend the claim set, replacing all prior versions, without prejudice or disclaimer of the subject matter thereof, as detailed in the following complete listing of all claims:

Listing of claims:

1. (Currently amended) A ball penetrometer for in situ measurement of soft soil properties, including:
   a) a spherical body attached to the end of a shaft, the shaft being of substantially smaller diameter than the diameter of the spherical body and being adapted to associate with a module containing an axial force measuring sensor and data transmitter; and,
   b) a sleeve member enclosing the shaft, the sleeve member being of substantially smaller diameter than the diameter of the spherical body and adapted to isolate the shaft from external soil friction while allowing axial movement of the spherical body and the shaft.

2. (Original) The penetrometer as claimed in claim 1, wherein at least part of the surface of the spherical body is provided with or formed of a porous material, the spherical body also including at least one passage providing for fluid communication between the porous material and a pressure sensor.

3. (Original) The penetrometer as claimed in claim 2, wherein the porous material is provided as a circumferential porous ring.

4. (Original) The penetrometer as claimed in claim 3, wherein the pressure sensor measures pore water pressure of the soil in contact with the porous ring.

5. (Previously presented) The penetrometer as claimed in claim 1, wherein the axial force measuring sensor is bi-directional.

6. (Previously presented) The penetrometer as claimed in claim 1, wherein at least one flexible sealing member associates the sleeve member with the spherical body, and at least one flexible sealing member associates the sleeve member with housing of the module.

7. (Previously presented) The penetrometer as claimed in claim 2, wherein the pressure sensor is located within the module and the shaft includes at least one passage providing fluid communication to the pressure sensor.

8. (Previously presented) The penetrometer as claimed in claim 2, wherein there is provided more than one passage arranged radially.

9. (Previously presented) The penetrometer as claimed in claim 1, wherein the module is an electronics module.

10. (Original) The penetrometer as claimed in claim 9, wherein the penetrometer is interchangeable between different types of electronics modules.

11. (Original) The penetrometer as claimed in claim 6, wherein the at least one flexible sealing member is at least one o-ring.

12. (Previously presented) The penetrometer as claimed in claim 2, wherein the spherical body is constructed from two hemispherical bodies that together define the at least one passage.

13. (Currently amended) A ball penetrometer for in situ measurement of soft soil properties, including:

a) a spherical body attached to the end of a shaft, the shaft being of substantially smaller diameter than the diameter of the spherical body and being adapted to associate with a module containing an axial force measuring sensor and data transmitter; and,

b) at least part of the surface of the spherical body provided with or formed of a porous material, the spherical body also including at least one passage providing for fluid communication between the porous material and a pressure sensor, the at least one

passage containing an internal fluid held within the spherical body at least partially by the porous material.

14. (Currently amended) The penetrometer as claimed in claim 13, including a sleeve member enclosing the shaft, the sleeve member being of substantially smaller diameter than the diameter of the spherical body and adapted to isolate the shaft from external soil friction while allowing axial movement of the spherical body and the shaft.

15. (Previously presented) The penetrometer as claimed in claim 13, wherein the porous material is provided as a circumferential porous ring.

16. (Previously presented) The penetrometer as claimed in claim 13, wherein the pressure sensor measures pore water pressure of the soil in contact with the porous ring.

17. (Previously presented) The penetrometer as claimed in claim 13, wherein the axial force measuring sensor is bi-directional.

18. (Original) The penetrometer as claimed in claim 14, wherein at least one flexible sealing member associates the sleeve member with the spherical body, and at least one flexible sealing member associates the sleeve member with housing of the module.

19. (Previously presented) The penetrometer as claimed in claim 13, wherein the pressure sensor is located within the module and the shaft includes at least one passage providing fluid communication to the pressure sensor.

20. (Previously presented) The penetrometer as claimed in claim 13, wherein there is provided more than one passage arranged radially.

21. (Previously presented) The penetrometer as claimed in claim 13, wherein the module is an electronics module.

22. (Original) The penetrometer as claimed in claim 21, wherein the penetrometer is interchangeable between different types of electronics modules.

23. (Original) The penetrometer as claimed in claim 18, wherein the at least one flexible sealing member is at least one o-ring.

24. (Previously presented) The penetrometer as claimed in claim 13, wherein the spherical body is constructed from two hemispherical bodies that together define the at least one passage.

25. (Currently amended) A penetrometer for in situ measurement of soft soil properties, including:
    a) an ellipsoidal body attached to the end of a shaft, the shaft being of substantially smaller diameter than the diameter of the ellipsoidal body and being adapted to associate with a module containing an axial force measuring sensor and data transmitter; and,
    b) a sleeve member enclosing the shaft, the sleeve member being of substantially smaller diameter than the diameter of the ellipsoidal body and adapted to isolate the shaft from external soil friction while allowing axial movement of the ellipsoidal body and the shaft.

26. (Currently amended) A penetrometer for in situ measurement of soft soil properties, including:
    a) an ellipsoidal body attached to the end of a shaft, the shaft being of substantially smaller diameter than the diameter of the ellipsoidal body and being adapted to associate with a module containing an axial force measuring sensor and data transmitter; and,
    b) at least part of the surface of the ellipsoidal body provided with or formed of a porous material, the ellipsoidal body also including at least one passage providing for fluid communication between the porous material and a pressure sensor, the at least one passage containing an internal fluid held within the ellipsoidal body at least partially by the porous material.

27. (Currently amended) A method of in situ measurement of soft soil properties using a ball penetrometer, the ball penetrometer including a spherical body attached to an end of a shaft, the shaft being of substantially smaller diameter than the diameter of the spherical

body and being adapted to associate with a module containing an axial force measuring sensor and data transmitter, and a sleeve member enclosing the shaft, the sleeve member being of substantially smaller diameter than the diameter of the spherical body and adapted to isolate the shaft from external soil friction while allowing axial movement of the spherical body and the shaft, the method including the steps of:

a) forcing the ball penetrometer to penetrate a soil bed at a known rate;

b) measuring the force resisting penetration of the spherical body into the soil bed; and,

c) transmitting measurement data to a remote operating station for processing.

28. (Currently amended) A method of in situ measurement of soft soil properties using a ball penetrometer, the ball penetrometer including a spherical body attached to an end of a shaft, the shaft being of substantially smaller diameter than the diameter of the spherical body and being adapted to associate with a module containing an axial force measuring sensor and data transmitter, and at least part of the surface of the spherical body provided with or formed of a porous material, the spherical body also including at least one passage providing for fluid communication between the porous material and a pressure sensor, the at least one passage containing an internal fluid held within the spherical body at least partially by the porous material, the method including the steps of:

a) forcing the ball penetrometer to penetrate a soil bed at a known rate;

b) measuring the force resisting penetration of the spherical body into the soil bed;

c) measuring the pore water pressure of the soil in contact with the porous material by measuring the pressure of the internal fluid; and,

d) transmitting measurement data to a remote operating station for processing.

29. (Previously presented) The method as claimed in claim 27, wherein additional steps are provided between steps (b) and (c) as:

b1) withdrawing the ball penetrometer from the soil bed at a known rate; and

b2) measuring the force resisting removal of the spherical body from the soil bed.

30. (Original) The method as claimed in claim 27, wherein at least part of the surface of the spherical body is provided with or formed of a porous material, the spherical body also including at least one passage providing for fluid communication between the porous material and a pressure sensor, and the method includes measuring the pore water pressure in contact with the porous material.

31. (Previously presented) The method as claimed in claim 27, wherein measurements are taken as a function of depth into the soil bed or of time.

32. (Previously presented) The method as claimed in claim 27, wherein the ball penetrometer is deployed from an apparatus on the seafloor.

33. (Original) The method as claimed in claim 32, wherein a connector rod or series of connector rods are provided to facilitate deployment of the ball penetrometer and progressively extend penetration into the seabed.

34. (Previously presented) The method as claimed in claim 27, wherein the measurement data is transmitted wirelessly from the module to a remotely operated seabed system.

35. (Previously presented) The method as claimed in claim 27, wherein the ball penetrometer is deployed via a wireline drillstring and measurement data is transmitted to the remote operating station via a wired electrical connection.

36. (Previously presented) The penetrometer as claimed in claim 3, wherein the pressure sensor is located within the module and the shaft includes at least one passage providing fluid communication to the pressure sensor.

37. (Previously presented) The penetrometer as claimed in claim 3, wherein there is provided more than one passage arranged radially.

38. (Previously presented) The method as claimed in claim 28, wherein additional steps are provided between steps (b) and (c) as:

b1) withdrawing the ball penetrometer from the soil bed at a known rate; and

b2) measuring the force resisting removal of the spherical body from the soil bed.